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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1st Named Inventor: David T. Jennings III **Serial No.:** 10/620,115 **Filed:** 7/15/2003 **Title:** Constant-Current, Rail-Voltage Regulated Charging Electronic Detonator	**Group Art Unit:** 3641 **Examiner:** Henry A. Blackner

DECLARATION UNDER 37 C.F.R. § 1.132

I, Gimtong Teowee, do declare and state as follows:

1. All statements herein are made based on my own personal knowledge except where it is indicated that a statement is based on information and belief. All statements made of my own knowledge are true, and all statements made on information and belief are believed to be true.

2. I hold a B.S. in electrical engineering from the University of Rochester (1985), and a Ph.D. in materials science and engineering from the University of Arizona (1992). I worked in the automotive electronics industry for seven years and have been working in the detonator field for nearly two years.

3. I have closely reviewed and am familiar with the above-noted patent application ("this application"), including the twenty originally-filed claims. I have also reviewed the Office Action mailed on December 18, 2003 in this application ("the Office Action"), particularly the prior art rejections set forth on pages 4-9 therein. I have also reviewed the prior art references relied upon in those rejections, namely, U.S. Patent No. 5,460,093 to Prinz et al. ("Prinz") and U.S. Patent No. 5,014,622 to Jullian ("Jullian").

4. The Office Action rejects claims 1-17, 19, and 20 as clearly anticipated by Prinz, and claim 18 as obvious over the combination of Prinz and Jullian. Regarding independent claim 1, the Office Action states that "Prinz clearly illustrates ... a constant current charging module (54) ... ." Similarly, regarding claim 11, the Office Action states that "Prinz inherently illustrates, wherein the step of charging is a constant-current, rail-voltage limited charging process ... ." Finally, regarding independent claim 20, the Office Action states that "Prinz clearly illustrates, wherein the module is configured and/or programmed to respond ... by charging a firing capacitor ... with a constant-current, rail-voltage limited charging process ... ." In support of these contentions, the Office Action asserts in the last full paragraph of page 6 and in the second full paragraph on page 8 that:

> The fundamental method of charging a capacitor involves: that upon applying a voltage to a capacitor, 1) the current draw of the capacitor is held at a constant value and that the stored voltage is increased at a linear rate and 2) as the stored voltage approaches the required voltage value and is held constant, the current draw of the capacitor decreases.

5. These foregoing assertions quoted from the Office Action regarding the "fundamental method of charging a capacitor" and the disclosure of Prinz and are each incorrect. Fig. 12 and paragraph 61 of this application illustrate and describe the constant-current charging process. That process is not the fundamental method of charging a capacitor; to the contrary, the fundamental and conventional method of charging a capacitor is by applying a fixed voltage across the terminals of the uncharged capacitor. When a fixed voltage is applied across the terminals of an uncharged capacitor, the current drawn by the capacitor starts out high and gradually reduces until the charged voltage is reached. Thus, the current drawn is not remotely a constant current as recited in claims 1, 11, and 20.

6. Similarly, Prinz discloses that arming circuit 54 merely employs a switch 58 to charge the firing capacitor 32, and therefore plainly describes a conventional non-constant-current charging process as just explained. To achieve the constant-current charging of the present invention, circuitry far different from a simple *switch* would be required, such as the examples of a "current-mirror using two bipolar transistors or MOSFETs, a fixed gate-source voltage on a JFET or MOSFET, or a current feedback using an op amp or camparator" provided in paragraph 61 of this application. Prinz therefore fails to disclose or suggest constant-current charging, which is set forth in claims 1, 11, and 20.

7. Further, in the context of the electronic detonator system of the present application, adding the circuitry required to attain constant-current charging permits desirable reductions in sagging of the bus and potentially damaging surge to the firing capacitors, yet it does not introduce potentially unsafe conditions in order to do so (as can be the case with automatic charging up of firing capacitors upon powering up of the bus as in prior art). This solution was certainly not obvious at the time of the invention, and variations of it can also make possible a number of other advantages that would not have been anticipated. Such potential advantages are elucidated, for example, in paragraph 3 of this application discussing enhanced bus line monitoring and avoidance and/or reduction of malfunctions relating to shorted or defective capacitors and/or ignition elements, paragraphs 3 and 62 discussing simplified capacitor diagnostics, and paragraphs 59-60 regarding staggered charging of a potentially large number of detonators on the system.

8. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. § 1001), and may jeopardize the validity of this patent application or any patent issuing thereon.

Gimtong Teowee

Date: March 16, 2004